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Volker Hartkopf, Dr.-Ing., Dr.h.c., Professor of Architecture,
Director Center for Building Performance and Diagnostics
Carnegie Mellon University
UNEP Think Tank Chair Sustainable Buildings and Construction
5000 Forbes Ave. MMCH 415
Pittsburgh, PA 15213
00 14 12/ 2 68 - 62 63
hartkopf@cmu.edu'

The Robert L. Preger Intelligent Workplace and the Building as Power Plant /Invention Works

The presentation will discuss major challenges, present a vision for buildings of the future and introduce two high-performance building projects at Carnegie Mellon University, the Robert L. Preger Intelligent Workplace, and the Building as Power Plant /Invention Works.
KEY QUESTION: Taken as a whole, the built environment represents no company's core business, nor does it fall under the purview of a single governmental agency's core mission. It is instead the result of many actions, and influenced by numerous actors, while no one takes final responsibility. Should the universities assume this duty?

CHALLENGES:
- Worldwide growth of nonrenewable resource consumption and waste
- Finite reserves of nonrenewable resources (2009 world-wide peak of oil production)
- Finite carrying capacity of Earth
- 50% of world population living on less than $2/day and mostly on solar income
- The United States of America – the leader in fashion; instant gratification

When focusing on the built environment in the US, we realize that it:
- creates 40 percent of land-fill waste by weight, and 30 percent by volume
- consumes almost 40 pecent of the US's primary energy for operation and an additional 10 percent-20 percent (estimated) for building materials production
- contributes in the US, over 500 million tons of CO2 into the atmosphere per year from the generation of the electricity that is used for building operations (67 percent of total electricity - source: Energy Information Administration, Annual Energy Review 2001)
- produces 18 percent of the US's total annual CO2 emissions by cement production
- also offers potential for health and productivity savings in the range of $20-200 billion annually through improved practices and systems integration

THE ROBERT L. PREGER INTELLIGENT WORKPLACE:
THE LIVING AND LIVED-IN LABORATORY

The Robert L. Preger Intelligent WorkplaceTM (IW) is the result of an unprecedented collaboration between the Center for Building Performance and Diagnostics, the first National Science Foundation Industry/University Cooperative Research Center in the building industry, and its supporting industry and governmental members, organized in the Advanced Building Systems Integration Consortium (ABSIC). The 7000 square foot IW is a living laboratory of office environments and innovations.

Occupied in 1997 and continuously being adapted, the IW is a rooftop extension of Margaret Morrison Carnegie Hall on the Carnegie Mellon campus.

The project provides a test bed for:
- organizational innovations for the advanced workplace;
- innovations in information technology;
- innovative enclosure, HVAC, power, voice, data networking, and interior systems;

- products for thermal, air, visual, acoustic, connectivity, and spatial quality;
- demonstrations of products' performance in an integrated setting;
- training in material, component, and systems choices and their integration for performance; and hands-on training in instrumentation and metrics for evaluating performance and occupancy comfort, and in development of CAD packages for design, simulation and management.

BUILDING AS POWER PLANT /INVENTION WORKS

Building on the concepts of and experiences with the Intelligent Workplace™, a living (always adapted and updated) and lived-in laboratory at Carnegie Mellon University (Hartkopf and Loftness 1999, Napoli 1998), a research, development and demonstration effort is directed at the "Building as Power Plant – BAPP". This project seeks to integrate advanced energy-effective enclosure, Heating, Ventilation, and Air-Conditioning (HVAC) and lighting technologies with innovative distributed energy generation systems, such that most or all of the building's energy needs for heating, cooling, ventilating and lighting are met on-site, maximizing the use of renewable energies.